

Photonic Antenna Enhanced Middle Wave and Longwave Infrared Focal Plane Array with Low Noise and High Operating Temperature, Phase II

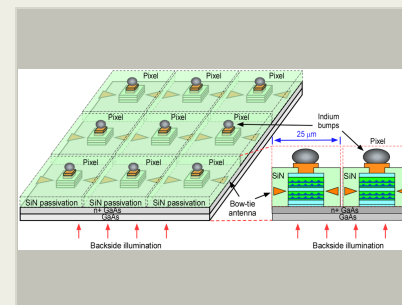
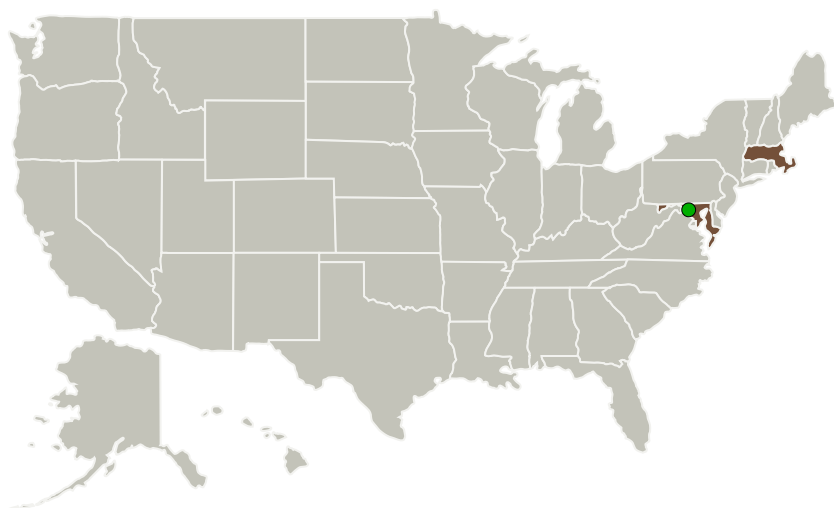
Completed Technology Project (2013 - 2015)



Project Introduction

Photodetectors and focal plane arrays (FPAs) covering the middle-wave and longwave infrared (MWIR/LWIR) are of great importance in numerous NASA applications, including earth remote sensing for carbon-based trace gases, Lidar mapping for earth resource locating, and environment and atmosphere monitoring. Existing MWIR/LWIR photodetectors have a low operating temperature of below 77K. The requirement for cryogenic cooling systems adds cost, weight and reliability issues, making it unsuitable for satellite remote sensing applications. This STTR project aims to develop a new plasmonic photonic antenna coupled MWIR/LWIR photodetector and FPA with significantly enhanced performance and a high operating temperature. In Phase I, we developed a preliminary plasmonic photonic antenna enhanced MWIR/LWIR photodetector and demonstrated significant enhancement in photodetectivity and operating temperature. Antenna directivity is also tested and agrees with the simulation. The phase I results not only demonstrated the feasibility of achieving high performance MWIR/LWIR photodetector using the proposed innovation, but also show its promising potentials for high operating temperature FPA development. Motivated by the successful feasibility demonstration and the promising potentials, in this STTR Phase II project, we will develop a prototype of the plasmonic photonic antenna enhanced MWIR/LWIR FPA with a high operating temperature and demonstrate its earth remote sensing capability.

Primary U.S. Work Locations and Key Partners



Photonic antenna enhanced middle wave and longwave infrared focal plane array with low noise and high operating temperature

Table of Contents

Project Introduction	1
Primary U.S. Work Locations and Key Partners	1
Project Transitions	2
Images	2
Organizational Responsibility	2
Project Management	2
Technology Maturity (TRL)	3
Technology Areas	3
Target Destinations	3

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Organizations Performing Work	Role	Type	Location
Applied NanoFemto Technologies, LLC	Lead Organization	Industry	Lowell, Massachusetts
● Goddard Space Flight Center(GSFC)	Supporting Organization	NASA Center	Greenbelt, Maryland
University of Massachusetts-Lowell	Supporting Organization	Academia	Lowell, Massachusetts

Primary U.S. Work Locations

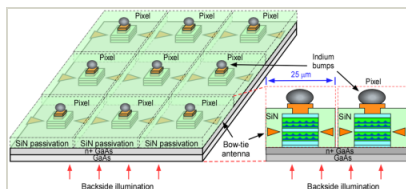
Maryland	Massachusetts
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Project Transitions

▶ **July 2013:** Project Start

✓ **July 2015:** Closed out

Images



Project Image

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(<https://techport.nasa.gov/image/137219>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Applied NanoFemto Technologies, LLC

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Jarrold Vaillancourt

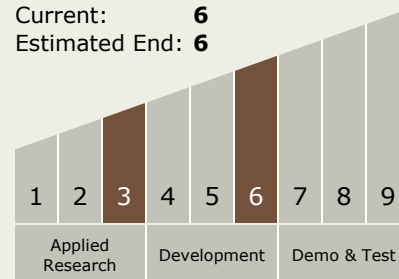
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Technology Maturity (TRL)

Start: **3**
Current: **6**
Estimated End: **6**



Technology Areas

Primary:

- TX08 Sensors and Instruments
 - └ TX08.1 Remote Sensing Instruments/Sensors
 - └ TX08.1.1 Detectors and Focal Planes

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System